Egg-Scape Basket

TEACHER SECTION

Grade Level: 5-8
Subject(s):
Space Science, Mathematics
Prep Time:
10 minutes
Duration:
One to two class periods
Materials Category:
Special

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Objective

To construct an emergency escape system

National Education Standards

Science

Physical Science

Properties and changes of properties in matter

Science and Technology

Abilities of technological design

Mathematics

Represent and analyze mathematical situations and structures using algebraic symbols

Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationship

Understand relationships among the angles, side lengths, perimeters, areas and volumes of similar objects

Formulate questions that can be addressed with data and collect, organize and display relevant data

Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots

Technology Literacy

Students will develop an understanding of the attributes of design.

Students will develop an understanding of engineering design.

Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.

Students will develop the abilities to apply the design process.

Pre-lesson Instructions

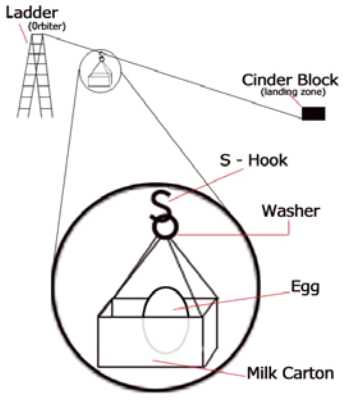
- Divide the class into teams of four students.
- Have team members bring in a decorated raw egg to represent a crew member for their emergency escape and an egg carton to display their egg-stronauts.
- Arrange for three judges (teachers, administrators or older students) to vote on the Best-Looking Crew Award prior to the competition. Decide on criteria for judging. (A copy of the award is at the end of the Teacher Page.)
- Several team award ideas have been included in this lesson. Use the awards included, or create your own. Prepare team awards before the day of competition. (See the Best-Looking Crew Award Judge Sheets.)
- This activity requires an open area where a 4.57-meter (15-foot) piece of string can be extended from a 2.4-meter (8-foot) ladder 3.8 meters (12.5 feet) away from a wall or two cinder blocks stacked one on top of each other. Suggested set-up is shown at right.

MATERIALS (per team)

- *Raw egg (one per team member)*
- *One empty and cleaned individual-size juice or milk carton*
- *Box cutter (not to be used by younger students)*
- *Scissors*
- *One piece of nylon fishing string 4.75 meters (15 feet)*
- *One large metal washer*
- *0.5 meter (20 inches) of yarn or string*
- *Stopwatch*
- *Other materials (for creativity)*

Teacher

- *Stopwatch*
- *2.4-meter (8–foot) ladder*
- *Duct tape*
- *Team Statistics Chart*
- *Paper towels*
- *Bottle of all-purpose cleaner*
- *Two cinder blocks or a cinder block wall*
- *Measuring tape*
- *S-hooks*



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TEACHER SECTION

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Background Information

Every facility needs an emergency escape plan. Space Shuttle astronauts practice for an emergency escape from the Orbiter. The space term for the maneuver is called an emergency egress. Should an emergency situation arise, astronauts have several options for quickly exiting the crew compartment area, depending on how far the launch has progressed.

When the Orbiter is on the ground awaiting liftoff, astronauts would use the Emergency Exit System. It's positioned 59 meters (195 feet) above the ground, at the same level as the Orbiter Access Arm, and includes seven baskets suspended from seven slidewires that extend to a landing zone 366 meters (1,200 feet) away from the Shuttle. The astronauts climb in the baskets, where a braking system, catch net and drag chain slow and then stop the baskets. The baskets slide down the wire at about 88 kilometers (55 miles) per hour. The angle of the slidewire causes the astronauts to move as far away from the Shuttle as possible.

In this lesson, students will be working as teams to get their crew of raw eggs (egg-stronauts) to the ground quickly and safely.

Guidelines

1. Discuss the different escape plans used by astronauts and emergency plans used by the school. Focus on the importance of having an escape plan and practicing those plans prior to an emergency.
2. Distribute the Student Pages.
3. Review the directions on the Student Page.
4. Assign a day for the competition.
5. Scorekeepers will record the total escape time, the condition of the crew eggs and the number of braking systems used on the Team Statistics Chart.
6. Place a starting line 1.5 meters (5 feet) from the competition area.
7. One at a time each team will position themselves behind the starting line.
8. Start timing each team as soon as the command is given to abort the mission. Each team will start from behind the starting line, connect their slide wire, attach their crew eggs and begin egress. Stop the timer as soon as the crew eggs touch the ground.
9. Instruct the teams to place their eggs on a paper towel after their egress to check for cracks in their eggs.

Discussion / Wrap-up

- After the "egg-scape" competition, analyze the data from the Team Statistics Chart.
- Instruct teams to calculate their "egg-scape" basket average speeds, and submit their results.
- Present awards to the teams.

Extensions

- Instruct the teams to create mission patches for their egg-ceptional egg-stronauts.
- Instruct each team to write a creative story about their egg crew. Encourage teams to be creative!
- Instruct the students to graph the average of the results of each team's egg-scape basket.
- Raise the question: Is the speed the same everywhere on the escape route?

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Best-Looking Crew Award Judge Sheet

Use a scale from 1-10 (10=highest and 1=lowest)

Team	Are all Eggs decorated?	Was a variety of materials used to decorate the egg?	Did the eggs resemble crew members?	Total points

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Team Statistics Chart

Egg-scape Competition

Teams	Total escape time *Rank 1-10	Egg-scape basket speed *Rank 1-10	Number of braking systems	Number of eggs cracked *Rank 1-10	**Best looking crew points	Overall total points

*** Rank from fastest to slowest, with 10 being the fastest and 1 being the slowest.**

**** Talley judging sheets for best-looking crew, and enter the results in this column.**

Best Looking Crew Award

for the crew with egg-straordinary style

Name

Award Presented by

Date

Ultimate Safety Award

for the team that goes the egg-stra mile for safety

Name

Award Presented by

Date

Fastest Egg-scape Award

for the team who has a need for speed

Name

Award Presented by

Date

Scrambled Egg Award

for the team that's all cracked up

Name

Award Presented by

Date

Most Creative Egress Award

for the team that thinks outside of the egg carton

Name

Award Presented by

Date

Best Overall Egress Award

for the team that egg-celled every step of the way

_____

Name

_____

Award Presented by

_____

Date

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STUDENT SECTION

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Background Information

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In this lesson, students will be working as teams to get their crew of raw eggs (egg-stronauts) to the ground quickly and safely.

MATERIALS

- *Raw egg (one per team member)*
- *One empty and cleaned small juice or milk carton*
- *Scissors*
- *One piece of nylon fishing string*
- *One large metal washer*
- *Yarn or string*
- *Stopwatch*
- *Optional materials as provided by your teacher.*

Procedure

1. Brainstorm with your group about how to decorate the egg-stronauts to compete in the Best-Looking Crew competition. Remember, Shuttle crews always wear the same flight suits, but the rest is up to you. You will decorate your eggs at home, so be creative!
2. Follow the specifications below to construct an Egg-scape basket to carry your Egg-stronauts from a pretend Orbiter (top of ladder) on the launch pad to a safe landing zone on the ground..
   - Cut the top off of an empty rinsed carton. This will be your basket. It can be no more than 5 centimeters (2 inches) deep.
   - Use only four pieces of yarn or string to connect the basket to the metal washer.
   - No padding can be placed inside the basket.
   - You may decorate the outside of the basket.
3. Each team will be given precut nylon fishing string. This will be your slide wire that will extend from the Orbiter to the landing zone or ground.
4. Review the Background Information. Brainstorm ideas for creating braking systems for your basket. See specifications below.
   - Up to three different braking systems may be used.
   - Maximum points will be awarded for using three systems.
   - Once your basket is launched, it may not be handled until it is safely touching the landing zone (ground).
   - Keep in mind that all teams are competing against each other for the fastest time to complete a crew escape. (**Hint:** *You do not have to put all your eggs in one basket!*)
5. Each team must have an Emergency Exit Plan ready for competition. It is recommended that you practice outside the classroom to test your design.

STUDENT SECTION

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6. Listed below are the criteria on which you will be judged.
   - The best overall time to complete the crew escape from the Orbiter.
   - The number of braking systems used.
   - The number of uncracked egg-stronauts.
   - Creativity in decorating your crew.
   - The speed of each egg-scape basket. See the speed chart on the next page.

Average Speed = Distance/Time

Trial	Distance	Time	Average Speed
1			
2			
3			
4